From understanding the effects of driving behaviour on fuel consumption to a personalized eco-recommendation system

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Together with:

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The ECO-DRIVE project

- 4 Project partners:
  - Department of Transportation Planning and Engineering (NTUA)
  - Department of Topography – Laboratory of General Geodesy (NTUA)
  - Oseven Telematics
  - Nea Odos
- Duration of the project:
  - 36 months (June 2020 – June 2023)
- Framework Program:
  - ΕΣΠΑ 2014-2020 - Partnership Agreement on the Development Framework

Background

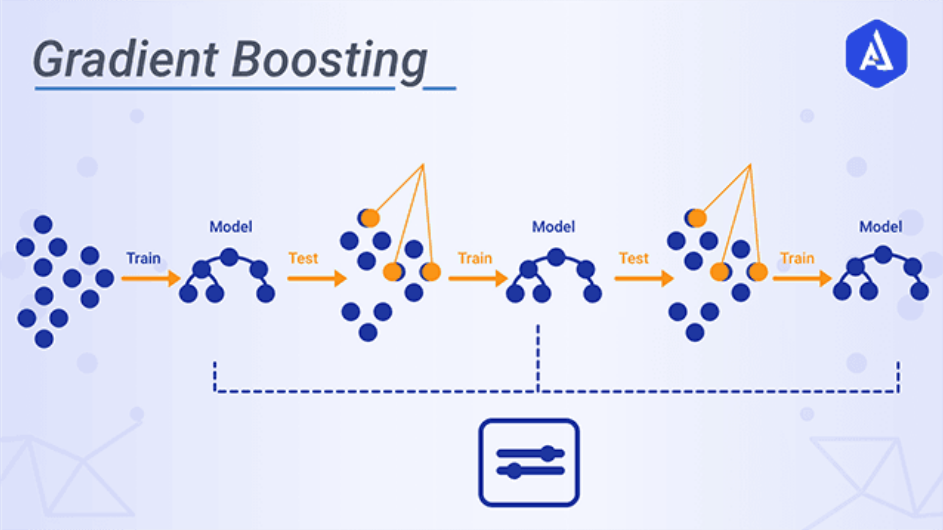
Development of a personalized framework for '**Eco-Recommendations System**' :

- Development of a **fuel consumption forecasting model**
- **Analysis of driving behaviour** and correlation with fuel consumption
- **Ecological footprint rating** of users based on driving behaviour
- **Provision of recommendations** for improving driving behaviour to minimize fuel consumption

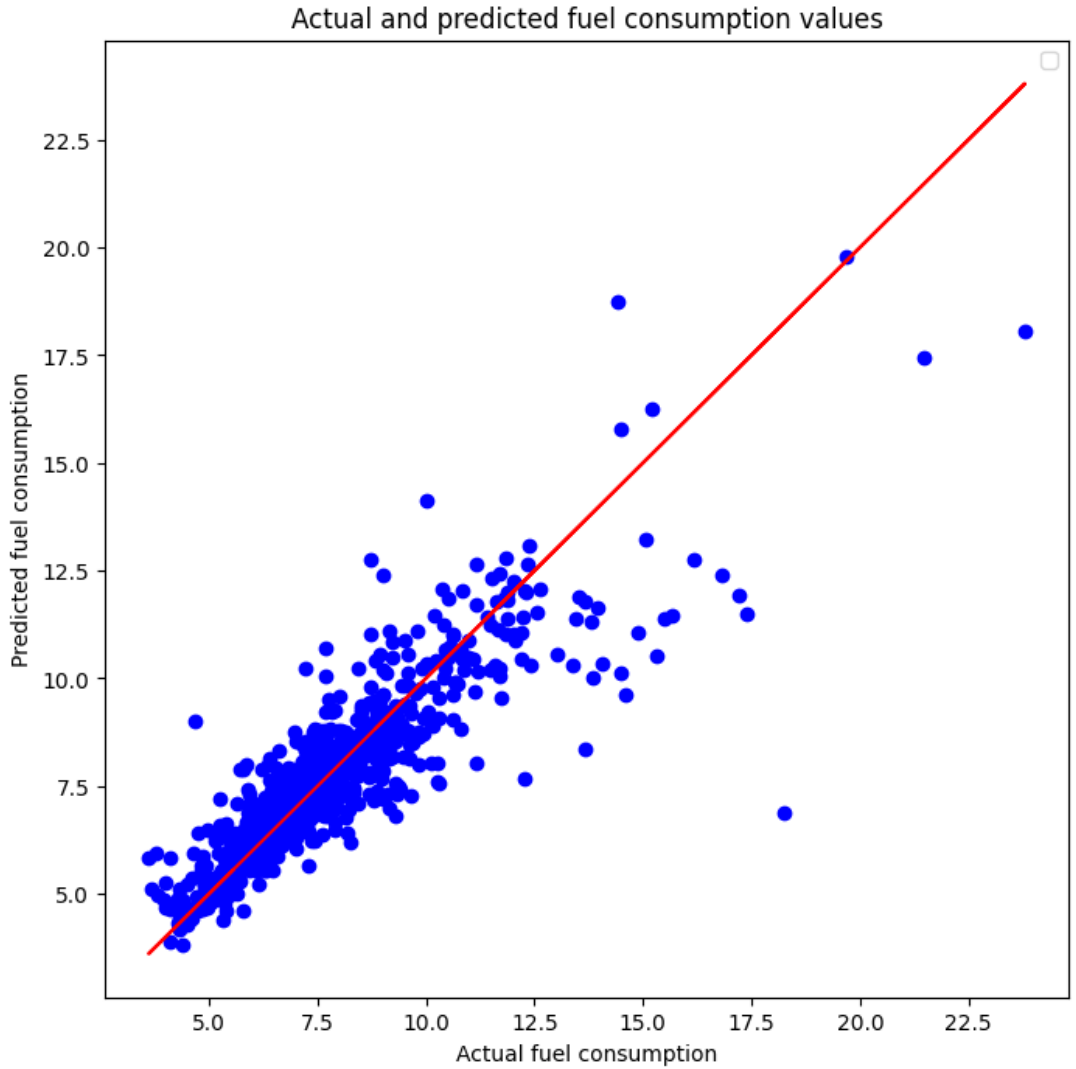
Development of a fuel consumption forecasting model

EcoDrive

Prediction model



Actual-Predicted values



METRICS

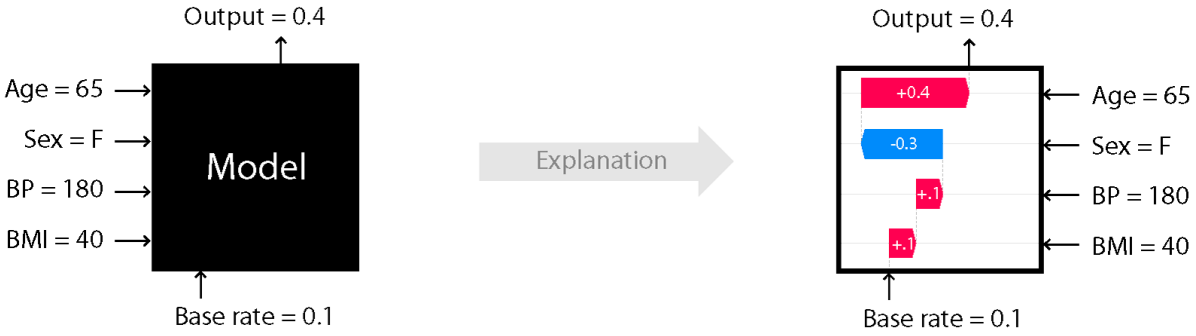
R2 score = 0.76212
Mean absolute percentage error = 8,99%
Total trips= 4183
Train-Test set= 80-20%
Dataset= 01/04/22-31/01/23

Analysis of driving behaviour and correlation with fuel consumption

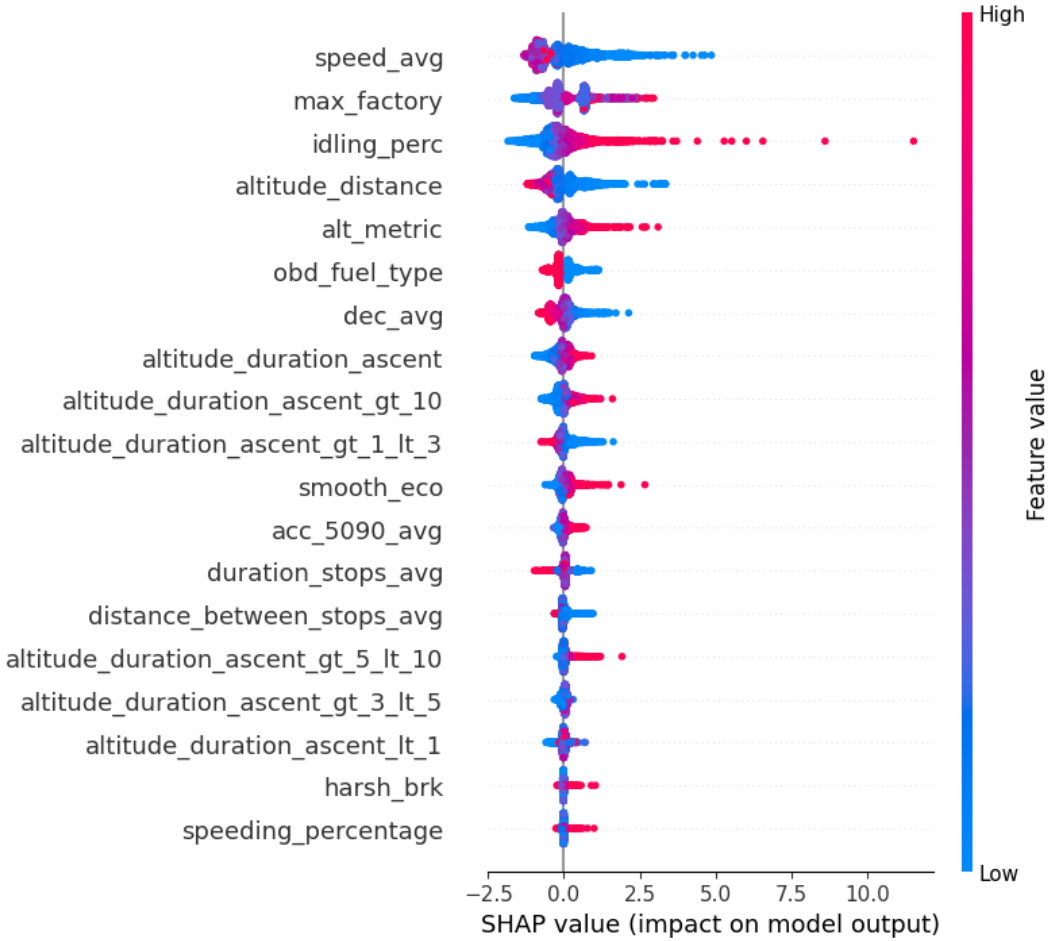
EcoDrive

Explainable AI

SHAP



Correlation of input variables value range on fuel consumption



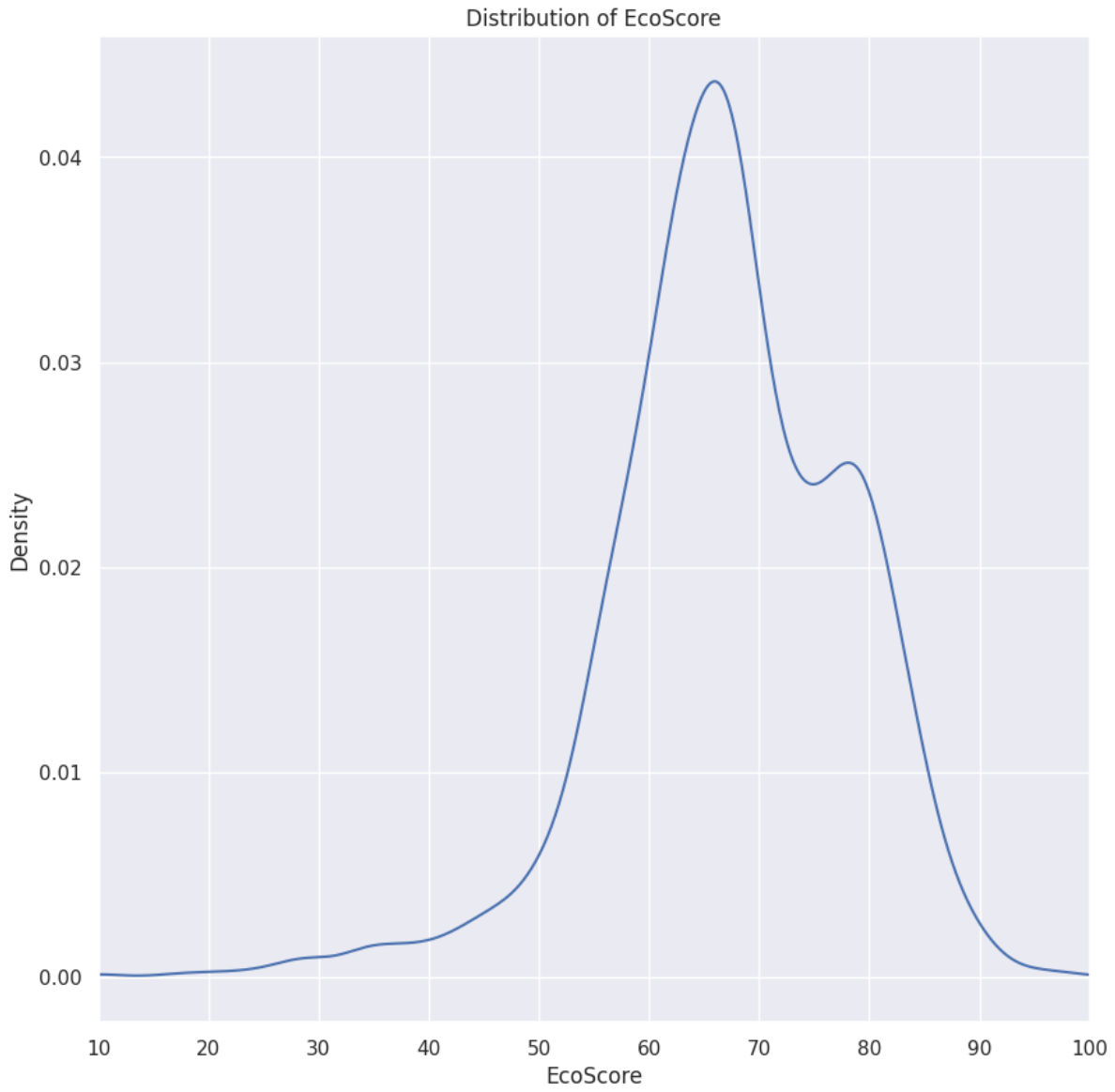
Ecological footprint rating of users based on driving behaviour

EcoDrive

Sum of SHAP values of behavioural variables per trip

Regularization techniques

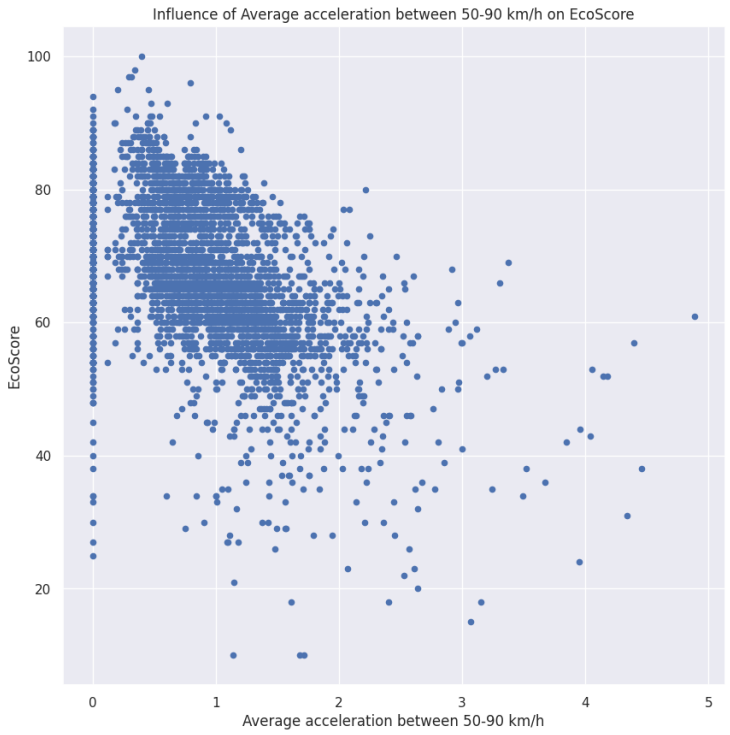
ECO-SCORE per trip



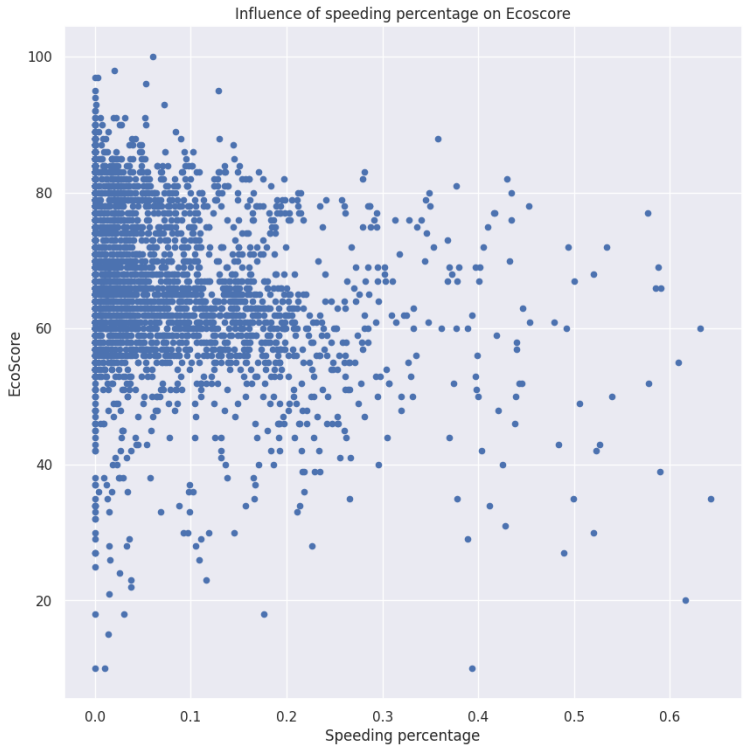
Ecological footprint rating of users based on driving behaviour

EcoDrive

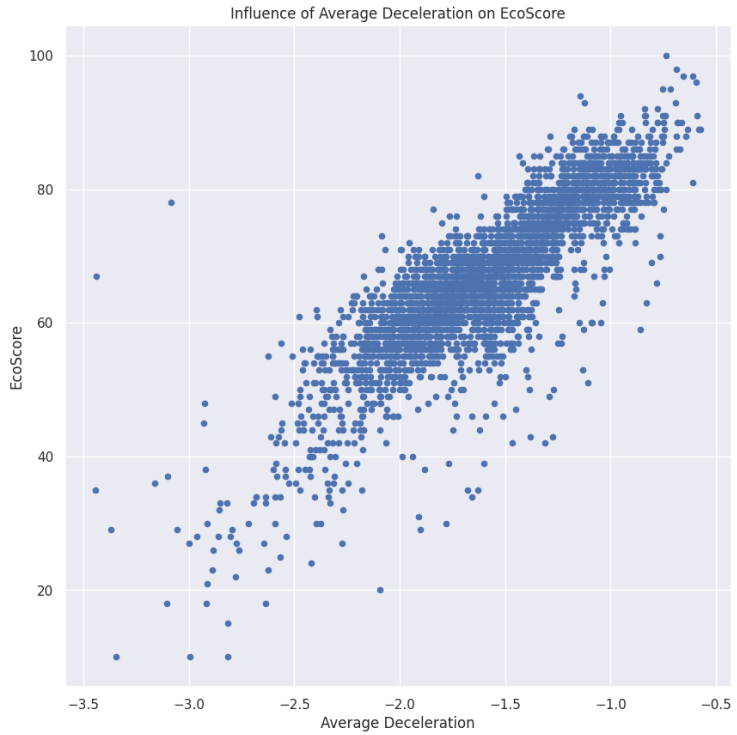
Acceleration between 50-90 km/h and ECO-SCORE



Speeding percentage and ECO-SCORE

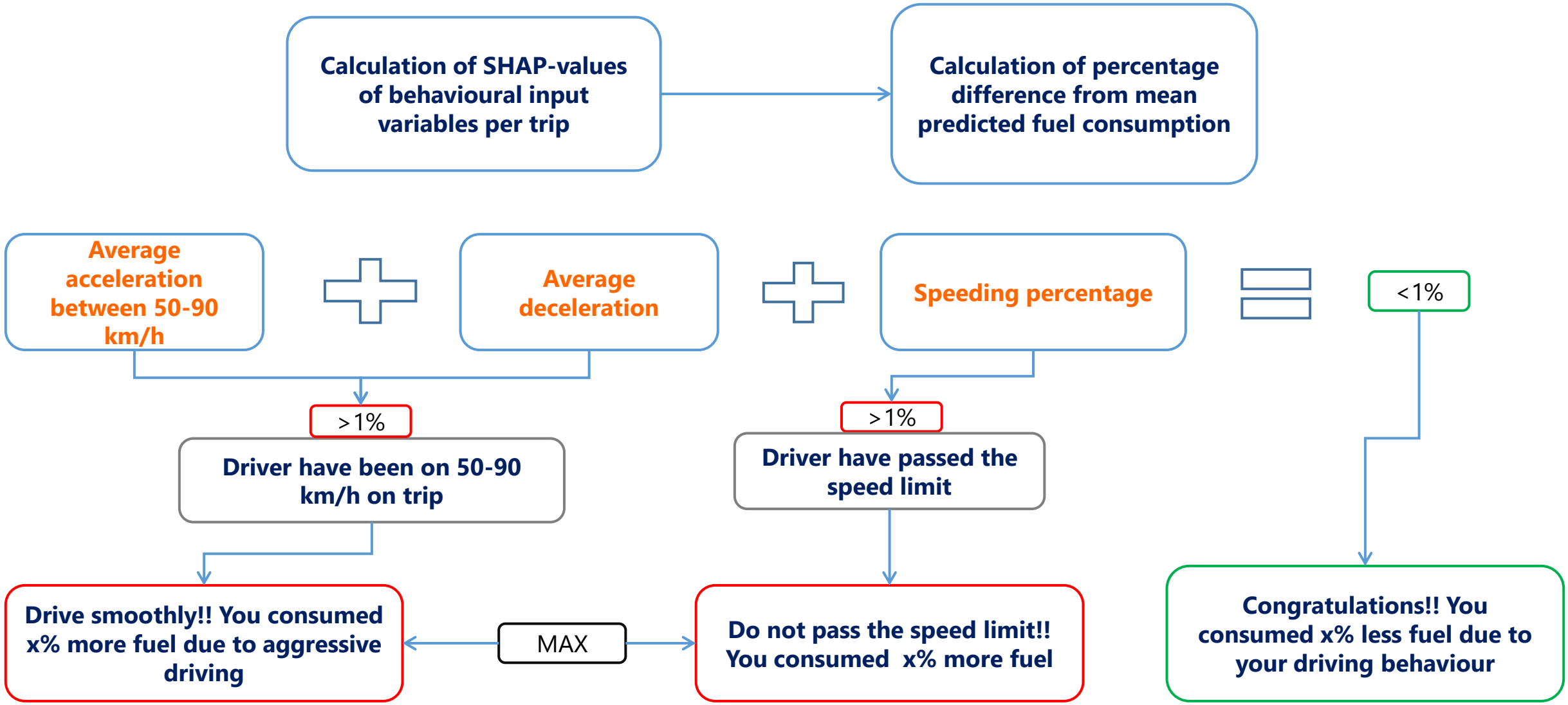


Deceleration and ECO-SCORE



Sum of SHAP values of behavioural variables per trip = ECO-SCORE

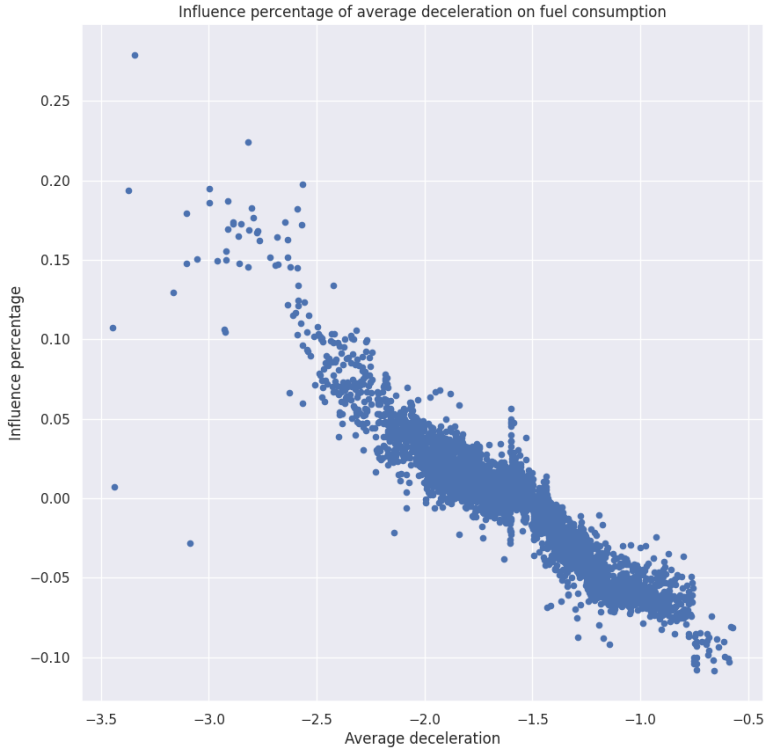
Fuel efficiency recommendations framework



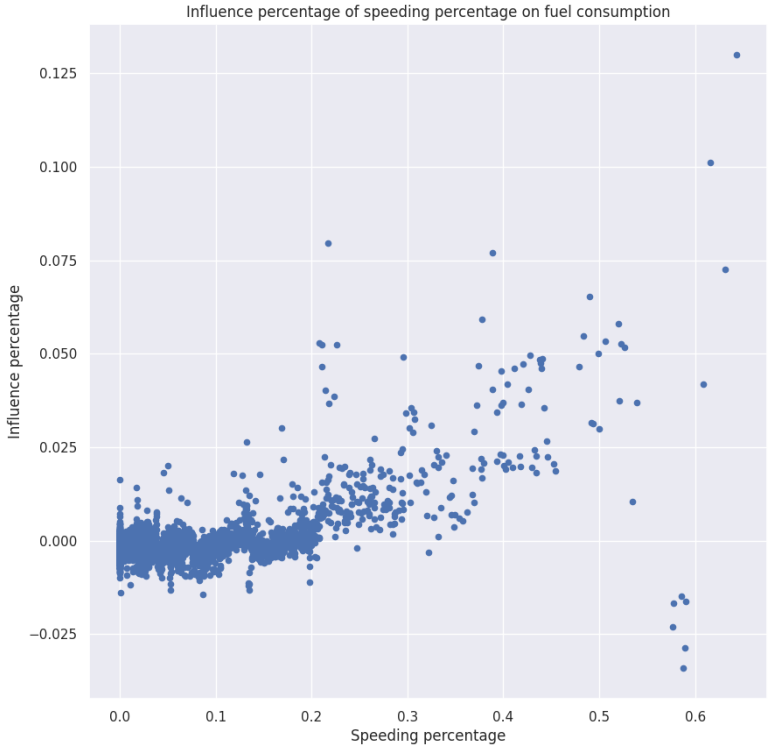
Correlation of behavioural variables with fuel consumption

EcoDrive

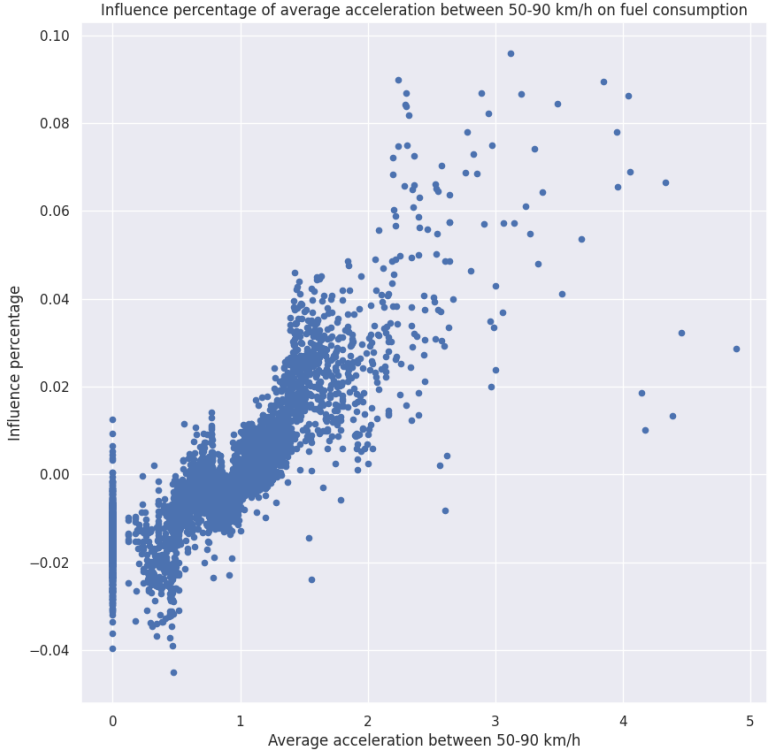
Average deceleration



Speeding percentage



Average acceleration between 50-90 km/h



Final result provided to the user

EcoScore

42/100

Recommendation

“Drive smoothly”

Information

Drive smoothly!! You consumed 5,2% more fuel due to aggressive driving

Conclusions and Future Research

- The proposed methodology achieves to provide the user recommendations in order to reduce the fuel consumption on a future trip and adopt an eco-mindset to a population
- The proposed methodology and its findings indicate that the behavioural characteristics of a driver affect in a great degree the fuel consumption
- Future Research will be focused on assessment of the methodology through simulations

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